



Integrity ★ Service ★ Excellence

SmallSat Parts On-Orbit Now (SPOON)

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SSP Overview

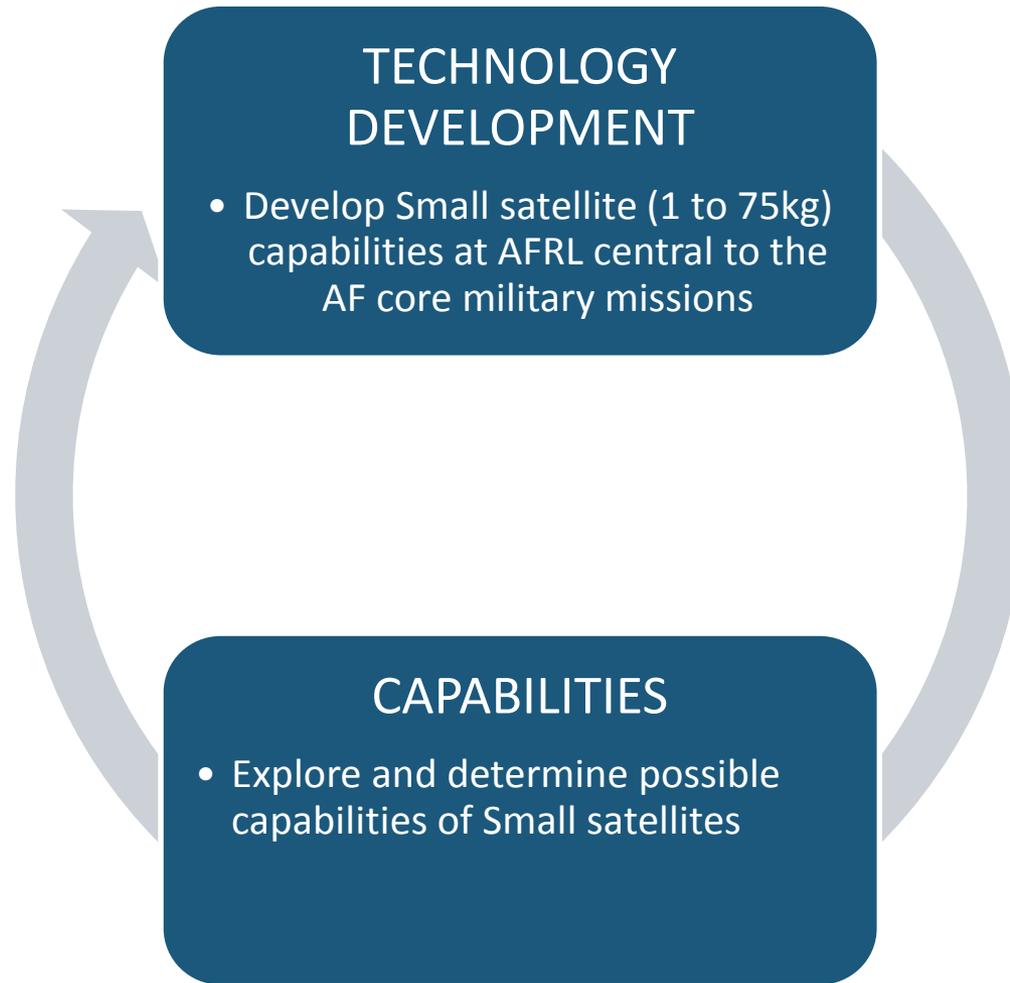


- 3 DoD and 13 University flight missions currently in SSP
- 5 launches to date
- Partnerships
 - 15 Universities
 - 9 Government Agencies
 - 4 International Partners
- 8 MOAs with STP
- 8 Educational Partnership Agreements with Universities



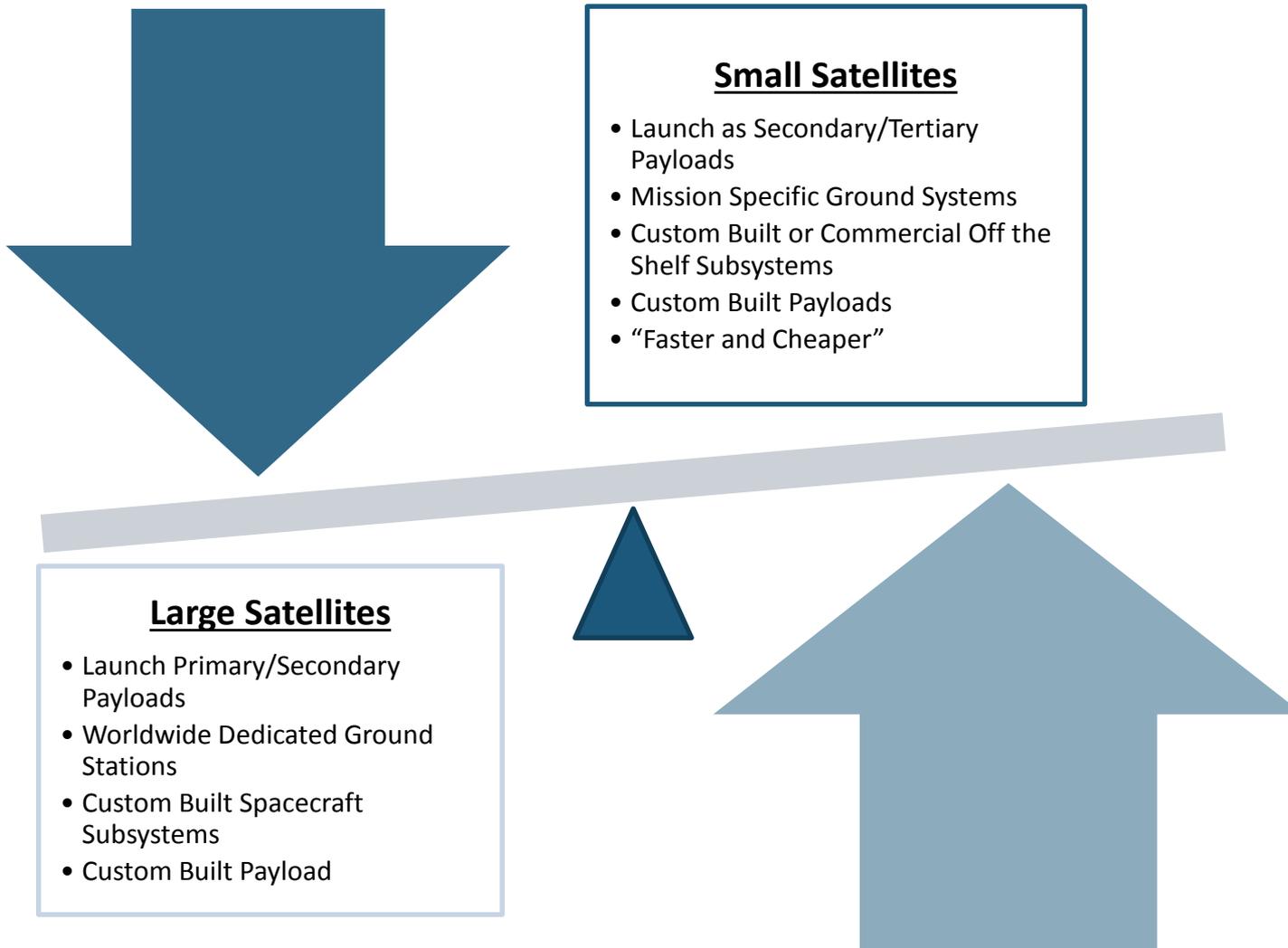


SSP Objectives





The Problem

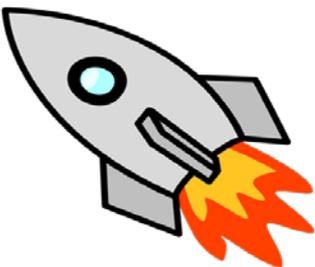




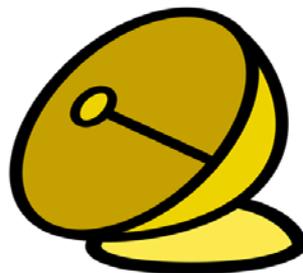
The Solution



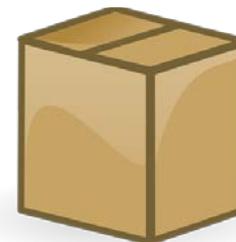
“Minimize the Variables”



Launch



Ground Systems



COTS Parts

“Focus on the Mission”



Payload



Focus on Mission



Quickly analyze mission concepts

- Determine mission success probability
- Establish resources required before investing

Use Successful Components

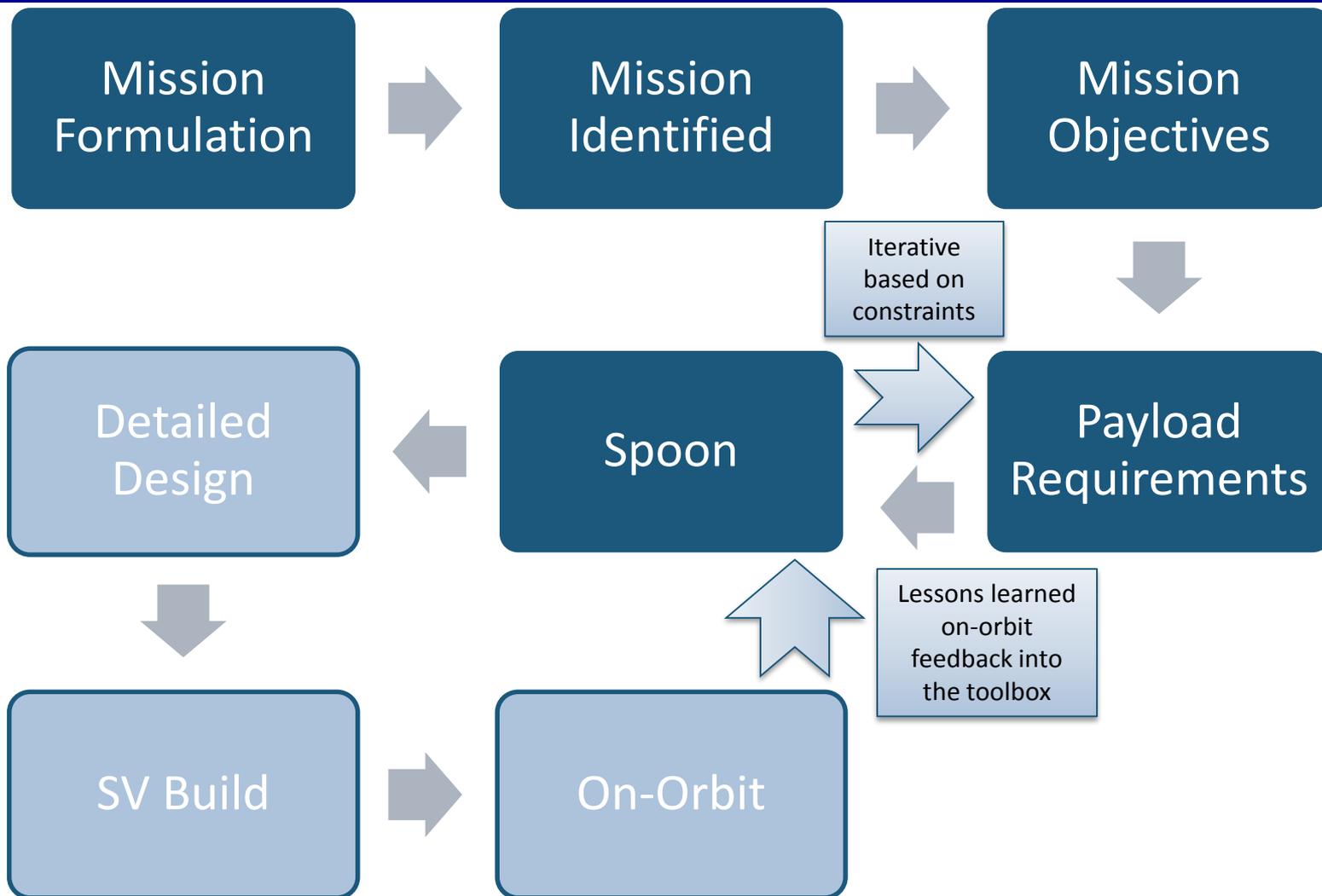
- High TRL hardware
- Modular software schemes

Fold-In More Capable Systems

- Small Satellite component update frequency is high
- Eliminate 'Space Shuttle' paradigm



Mission Steps

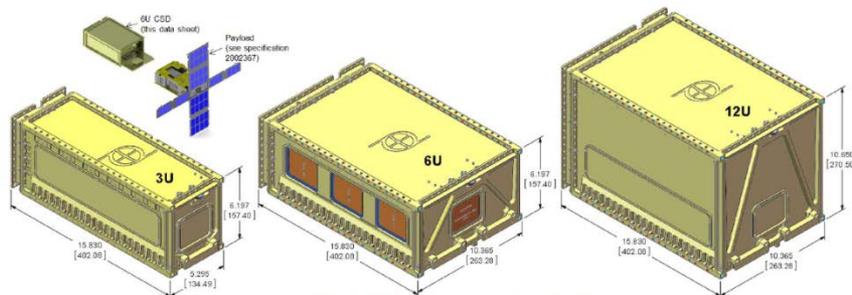




Small Satellites On-Orbit Now “Spoon” Approach



- Studies leverage “SPOON-like” approach to meet mission requirements while minimizing cost and schedule
- SV components are used in other SSP programs or in the community
 - Allows for tech refresh to be integrated in to the SV as subsystems are demonstrated
- Able to adapt to various mission assurance paradigms

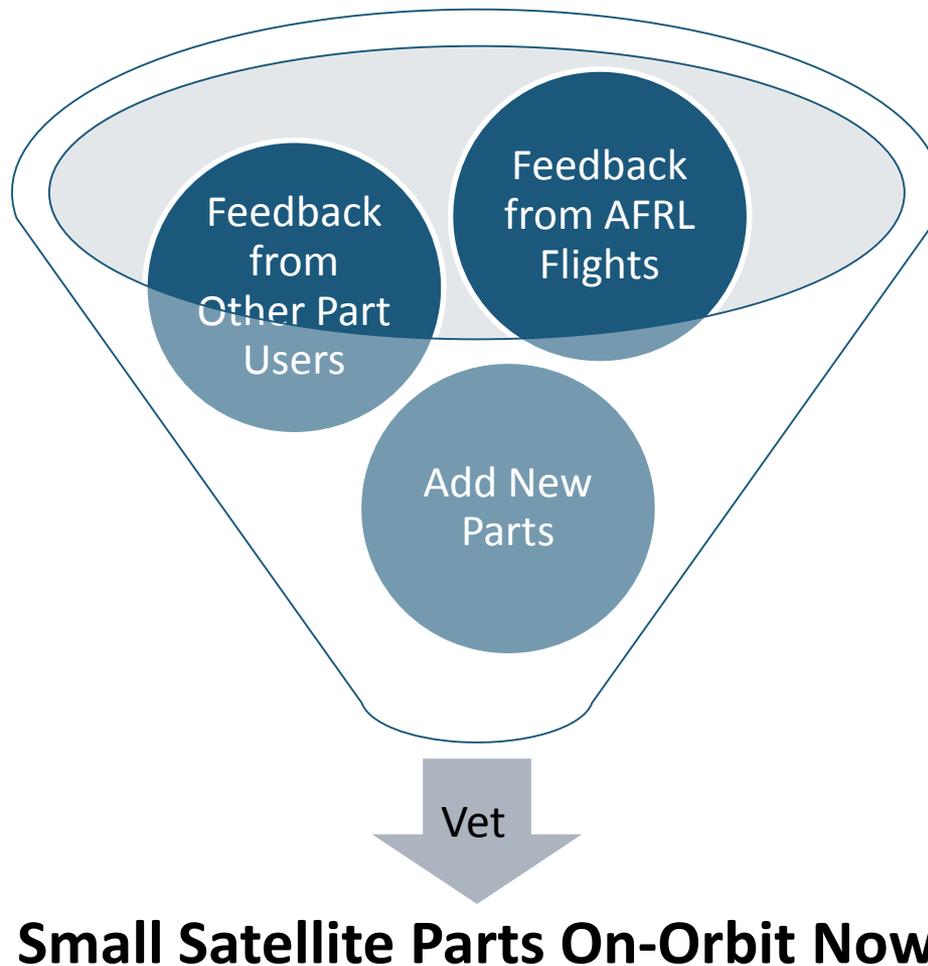


Subsystem	3U	6U	12U	μSat
ADCS	X			
Batteries	X			
C&DH	X	X	X	X
Data Interfaces	X	X	X	X
GPS	X			
EPS	X	X	X	X
Processors	X	X	X	X
Propulsion	X	X		
Radios	X	X	X	X
Software OS	X	X	X	X
Solar Cells	X	X	X	

X = Currently Tracked in SPOON



What is SPOON?





Why Use SPOON?



Easily Find Parts that Meet Mission Needs



Compare Parts Specifications



Create Space Vehicle ICDs



Determine a Subsystems Flight Heritage



Help the Community Focus on Mission





SPOON Progress



SPOON CubeSat Database: Radios



This page features a table of radios. Table cells without data are presently unknown/to be determined. Dimensions are given as Length X Width X Height. The dropdown menu at the bottom may be used to display an individual row of the table.

Radio	Downlink Frequency	Downlink RF Power	Downlink Rate	Downlink Modulation	Downlink Error Correction	Uplink Frequency	Uplink Rate	Uplink Modulation	Uplink Error Correction	Encryption	
L3 Cadet S-Band Radio	S-Band	2W	22Mbps	O-QPSK	Turbo FEC	S-Band	250kbps	FSK and GMSK	Convolutional coding	AES-256	8-1
L3 Cadet UHF Radio	UHF	2W	1.5Mbps	O-QPSK	Turbo FEC	UHF	250kbps	FSK and GMSK	Convolutional coding	AES-256	8-1
L3 Cadet S/U Radio	S-Band	2W	12.5kbps, 50 kbps, 200kbps, 1.6 Mbps, 3.2 Mbps	O-QPSK, GFSK	Turbo FEC	UHF	9600 bps, 50kbps	GFSK	FEC Convolutional	AES-256	16
MHX-2400 radio	S-Band	1W	115 kbps	-	CRC and FEC	S-Band	115kbps	-	CRC and FEC	-	2.7
AstroDev Colony II Radio	UHF (915MHz)	2W	57.6kbps	BPSK	-	UHF (450MHz)	9.6kbps	FSK and GMSK	-	-	-
AstroDev Lithium 1 Radio	UHF, S-Band	0.25W-4W	9.6kbps, 38.4kbps, 76.8kbps	FSK and GMSK	-	UHF, S-Band	9.6kbps, 38.4kbps, 76.8kbps	FSK and GMSK	-	-	-



SPOON: The Next Steps



- **Validate SPOON parts with on-orbit data**
 - **GEARRS**
 - **SHARC**
 - **Biarri**
 - **VPM**
 - **Future SSP missions**
 - **Other Agency missions**
- **Integrate Non-SSP components into SPOON**
 - **Working with other SmallSat groups (NASA, NPS, NRO, DARPA)**
- **Find missing data, need to research these components to fill in missing details**